

Report no. 96/EE/62

October 1996

Social impact assessment of Mchuchuma colliery and TPS

Draft report

Submitted to the
Central Mine Planning and Design Institute. Ranchi

Energy–Environment Interface
Tata Energy Research Institute

© Tata Energy Research Institute, 1996

A suggested format for citing this report is given below.

Sridharan P V, Sharma N. 1996

Social impact assessment of Mchuchuma and TPS. 27 pp.

New Delhi: Tata Energy Research Institute.

[Report no. 96/EE/62]

*To ascertain the availability of this report and the terms of supply,
please write to*

Energy-Environment Interface
Tata Energy Research Institute
Darbari Seth Block, Habitat Place
Lodi Road, New Delhi – 110 003
India

Telephone +91 11 46222 46

Fax +91 11 462 1770

Telex 31 61593 teri in

e-mail mailbox@teri.ernet.in

Contents

Session 1 Social impact assessment

Introduction

Scope of the study

Methodology for SIA

Step 1: Socio-economic survey

Step 2: Baseline information

Step 3: Identification and assessment of impacts

Step 4: Recommendations

Socio-economic status of the population in the study area

Demographic aspects

Economic activities

Income and expenditure

Infrastructural services

Health status in the area

Water availability

Fuel and power

Cultural profile

Session 2 Identification and assessment of social impacts

Direct impacts

Displacement of population

Population increase in the area

Availability of water

Impact on employment opportunities

Impact on poor families

Impact on forest products

Indirect impacts

Impact on health status

Impact on grazing land

Educational facilities

Communication network

Energy supply

- Banking services
- Impact on subsistence economy
- Impact on the existing practice of polygamy
- Impact on bride price

Session 3 Mitigation measures

Rehabilitation package for the project affected population

Water availability

Health facilities

- For water borne diseases

- For malaria

- For bilharzia

- For tuberculosis (TB)

- For scabies

- For respiratory diseases

Education facilities

Fuel supply

Afforestation

- Adequate grazing

- Banking facilities

Economic status of the local population

Changes to a woman's life

Recommendations

Tables

- 1 Age and sex-wise distribution of Nkomang'ombe village population (1988)
- 2 Ratio of males to females in different age groups
- 3 Literacy levels in Ludewa district (rural)
- 4 Enrollment at primary schools
- 5 Number of households sending children to school
- 6 Village wise distribution of fruit trees in Nkomang'ombe and Iwela wards
- 7 Livestock numbers in some of the villages of Nkomang'ombe ward
- 8 Skills existing in the Nkomang'ombe ward
- 9 Household income generating activity (for 38 households to be displaced)
- 10 Taxes levied
- 11 Population and number of households

Social impact assessment

Introduction

The social impact assessment (SIA) of the proposed Mchuchuma colliery and the thermal power plant in Nkomang'ombe ward covers the evaluation of the social consequences of the project. This project is being implemented by the National Development Corporation of Tanzania Government. This chapter aims to provide information to aid planners and decision makers to carry out more socially aware development in the area.

Tanzania is a sparsely populated country, although the population density is high in some regions. The country is divided into many regions. The Iringa region, in southern part of the country has 5 districts and one of them is Ludewa district. For administrative purposes Ludewa district is divided into 4 divisions. There are 20 wards in the district covering 46 villages. Nkomang'ombe, where the study area is located, is one of the wards in Masasi division of Ludewa district. The proposed mine and power station fall mostly in Nkomang'ombe ward and partly in Iwela ward.

Scope of the study

The SIA involves the following three stages

- Collection of baseline information of the socio-economic conditions prevailing in the affected area
- Based on the baseline information, positive and negative socio-economic impacts of the project in both the short and long term will be predicted
- Remedial measures will be identified and evaluated and a detailed implementation and monitoring plan will be recommended.

Methodology for SIA

The SIA has largely be done using secondary information collected from various government sources and field visit. Primary information is available for a total of 70 households in the villages of Idusi, Nkomang'ombe, Kimelembe and Iwela. Two different questionnaire formats were used, one for 32 households and the second for 38 households. The views of some of the project affected population (PAP) have been obtained. Certain assumptions were made for the SIA:

- questionnaires were conducted in an unbiased manner
- information received is not distorted. All answers are authentic and express the views of the respondents
- the results of the SIA will be included in the overall planning and implementation of the project.

The various steps involved in undertaking the study are as follows:

Step 1: Socio-economic survey

Collection of primary data related to the socio-economic conditions prevailing in the area - delimited to a radius of 10 kms around the project site. A detailed house to house survey was conducted in this area. Respondents were asked about their family size, education, health, economic well-being and their views about the proposed development.

Step 2: Baseline information

All primary information was then analysed and compiled to form the baseline information needed to undertake the assessment. Primary data is supported by secondary information provided by detailed studies previously done in the area.

Step 3: Identification and assessment of impacts

Checklist of environmental characteristics of the Department of Environmental Affairs, South Africa 1992 and World Bank Guidelines on Resettlement and Rehabilitation, have been used to guide the process of identifying the appropriate social impacts. Identified impacts have been assessed depending on the how it affects the overall well being of the affected individuals.

Step 4: Recommendations

On the basis of the assessment, a list of recommendations have been suggested to ensure that the benefits of the project accrue to the affected population over the life of the project.

Socio-economic status of the population in the study area

The study as per the terms of reference (TOR) is limited to an area of 10 kms around the proposed Mchuchuma colliery site. The baseline information of the socio-economic conditions in the study area include the following:

- Demographic aspects
- Economic activities
- Income and expenditure
- Infrastructure services
- Health profile
- Water availability
- Forestry
- Cultural profile

Demographic aspects

Nkomang'ombe ward, the focus of the study, has a population density between 15-20 persons per square kilometer. The population in the village has increased from 1,772 in 1988 to 2,012 in 1995. The age-wise and sex-wise distribution of population is given in Table 1.

Table 1. Age and sex-wise distribution of Nkomang'ombe village population (1988)

Age	0-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
Males	132	158	134	144	95	69	46	42	43	863
Females	149	127	126	172	118	81	71	41	24	909
Total	281	285	260	316	213	150	117	83	67	1772

Source: Iringa Regional Profile, 1988

The age wise distribution of the population clearly illustrates a pattern typical to a high fertility rate, as a significantly higher proportion of the population is in the younger age groups than in the older age groups. The 1988 census results show that 46.6% of the total population in the Nkomang'ombe village comprises of persons below 15 years of age. Nkomang'ombe's population structure exhibits a pattern where the ratio of number of males to females is in favour of women between the age group 15-54 years. However, for Ludewa district the gender ratio exhibits a predominance of females in the overall population numbers.

Table 2. Ratio of males to females in different age groups

Years	Nkomang'ombe		Ludewa district	
	Males	Females	Male	Female
0-14 yrs	1054	1000	956	1000
15-54 yrs	800	1000	746	1000

Source: Iringa Regional Profile, 1988

Dependency ratio

These ratios are indicators of the dependency responsibility of adults in their productive years. The ratio is calculated by dividing the total number of population below the age 15 years and those over 65 years by the total number of people between 15-64 years. On the basis of the statistics available for the village, the dependency ratio is 0.83. This essentially means that for there is roughly one dependent person for each adult in the population. For Ludewa district the dependency ratio is 1.07

Migration patterns

Movement of people from one area to another also affects the age and sex composition of the population. Out migration in Iringa region occurs because of low incomes and low infrastructural development. Migrant population primarily consists of young males who leave their homes for a better life in another area. Majority of people migrating from Nkomang'ombe village do not leave the region but move to one of the neighboring districts. Migration also leads to information transfer about work opportunities and land availability outside the area.

There has also been some degree of in-migration in the village. 15/38 families have moved into the area less than 10 years ago. Availability of land and food have been cited as the main reason for migration to the area. However, all respondents agreed that people from near by villages were moving into the village because of greater availability of land.

Literacy levels

Limited information is available related to the literacy levels prevalent in the village. Some inferences can be made, based on the overall literacy trends of the Ludewa district. Rural areas are known to have lower literacy levels than urban areas. Prior to the census undertaken in 1988, the literacy levels among the rural males was distinctly higher than that of rural females. Although the gap has reduced, percentage of literate males continues to be higher. The data indicates that in the rural areas of Ludewa district a greater percentage of female population aged between 5-14 years attend school in comparison to their male counterparts. This trend is reversed for secondary and higher education, where there are more male pupils. Trends show that in case of higher age groups the literacy levels decline for both men and women, although this decline is more pronounced in the adult female literacy rates. The overall literacy rate in the district is 61.2% and the sex-wise and age-wise break-up is given in Table 3.

Table 3. Literacy levels in Ludewa district (rural)

Years	5-14 yrs	15-24 yrs	25-49 yrs	Above 50 yrs	Total
Males (%)	41.7	93	82.9	63	69.1
Females (%)	45.9	89	57.5	24.6	56.8

Source: Iringa Regional Profile, 1988

The only relevant figures available concerning the literacy levels of the Nkomang'ombe ward are those of current enrollment of pupils in the two primary schools in the area (Table 4). According to the figures available, of the total number of children enrolled in the primary school, more than 54% are females and 45.9% are males. This is similar to the literacy trends available for the district.

Table 4. Enrollment at primary schools

Name of village	Total students	Total teachers
Nkomang'ombe	297	7
Kimbelembe	150	5

Source: Data collected, 1996.

Primary data collected for the villages show that nearly all families interviewed send their children to primary school. Only 4 children (3 boys and 1 girl) from the area attended the secondary school situated about 12 kms away. On the basis of this data it can be assumed that literacy levels in the Nkomang'ombe ward is relatively high.

Table 5. Number of households sending children to school

Name of village	Yes	No ²	Non applicable ³
Idusi	10	0	2
Nkomang'ombe	22	7	4
Kimelembe	7	1	2
Iwela	10	1	4

Source: Data collected, 1996

- ¹ Households sending children to school
² Households not sending children to school
³ Households without children of school going age

Economic activities

Nkomang'ombe is a rural ward where majority of the population is involved with agriculture. Few people are government or mission workers and owners of small businesses. It is a subsistence way of life with families producing little more than their own needs.

Agriculture

Since 1987, Ludewa district has experienced severe food shortages as a result of widespread crop destruction caused by pests, fungal diseases and floods. However, farming remains the mainstay of life in the area, practiced using traditional means and methods. Some people in the area have continued with the custom of shifting cultivation, moving every three years but the extent of such a practice is dependent on the availability of land.

The average agricultural plot size is 3 acres, the largest holding in the village is of 10 acres. About 50% of the total village population has access to good quality land.

Families cultivate the entire field using only the hand hoe. mechanised farming does not exist and it is rare to find animals used as draught power. Instances of oxen use for cultivation have been limited to some households in Kimelembe. Animal manure is the only type of fertilizer applied to the field.

The predominant crop produced is maize and cassava which forms the staple diet of the people. Only in Kimelembe, situated in the more fertile region of the village, sweet potato is grown as the main crop. Mixed cropping is undertaken by all households entirely as a security measure against crop failure of one or other of the crops. Other crops commonly grown in the village are finger millet, beans and sweet potato. All households interviewed said they grew cassava and maize. Most households also grew millet, groundnuts, sunflowers and beans. The main cash crop grown is tobacco. Cashew is also grown but the yield is insignificant. Few people are involved with the production of cash crops. On average tobacco is grown by the wealthier farmers of Nkomang'ombe as input costs are very high. In total there are 40 tobacco farmers in the village occupying 6 ha of land. Only one person interviewed in the village of Nkomang'ombe grew tobacco.

Agricultural activity is undertaken by both the men and women although, women are known to be doing most of the work. If the family is involved in cash crop production, men dominate the workforce.

Fruits and vegetables

Several types of vegetables and fruits are grown but horticultural activities are not common. Vegetables which are grown in the area include cabbage, yams, tomatoes, onions, potatoes, peas and *ochra* (lady finger). 2 households in Kimelembe said they grew sugarcane. Among the fruits, mango was the most widespread. 50 out of the 70 households questioned had at least one mango tree. Other fruits grown were bananas (47/70), oranges (26/70), papaya (16/70), lemon (5/70), coconut (5/70).

Table 6. Village wise distribution of fruit trees in Nkomang'ombe and lwela wards

Name of village	Guava	Orange	Coconut	Banana	Pawpaw	Total
Nkomang'ombe						
Mjimwena				113		113
Nyambalapi		25		10	15	40
Kimelembe	5	365		1111	11	1492
Mhambalasi						195
Igunga		73		2300	10	2383
Idusi						348
Iwela						
Kisekela		8			4	110

Source: Masasi Division Baseline Report, 1994

Livestock rearing

Most households maintain a small number of livestock. Livestock are generally used for household purposes. These animals are a source of food, manure, and store of wealth. Common livestock varieties are cattle, pigs, goats, rabbits, guinea pigs and poultry.

Table 7. Livestock numbers in some of the villages of Nkomang'ombe ward

Name of village	Chickens	Cows	Goats	Pigs	Total
Nkomang'ombe					
Kimelembe	505	32	63	5	605
Mjimwema	156	18	26	25	225
Nyambalapi	7	16	21	22	66
Igunga	194	28	25	20	267
Idusi					131
Mhumbi	-	-	-	-	-
Ntiule	54	37	3	17	111

Source: Masasi Division Baseline Report, 1994

44/70 households interviewed owned at least one cow. The indigenous shorthorn Zebu cattle is the species commonly owned by the people. Zebu cattle are favoured as these animals are disease resistant and can survive poor nutrition. Haulage animals like oxen, donkeys and horses are present only in Kimelembe. All livestock graze on common village lands and on the forest scrublands surrounding the villages. For the villages at the end of the dry season, adequate grazing is not available in some of the areas and animals have to be herded to valleys where all year grazing is possible. Boys and men are responsible for herding the animals. Pigs are the most commonly found livestock (59/70) in the village. Among other livestock, 50 households owned goats and 68 households kept some form of poultry i.e. chickens, ducks, etc.

Fishing

Fishing is carried out throughout the year at Lake Nyasa by Iwela residents and 7 respondents of Nkomang'ombe village. In Kimbelembe there were 2 respondents who stated that they fish. Fishing is dominated by men, women are responsible for cleaning and selling of the fish. Pisciculture has been promoted in the village Kimelembe. 5 fish ponds are present but are in poor condition. Besides, there is a lack of training among the local population on how to manage these fish ponds effectively.

Other activities

Many villagers are involved in activities like mat and pot making, beer brewing, maize milling, shop keeping. Masonry and brick laying were undertaken by three of the households questioned in Kimelembe.

Table 8. Skills existing in the Nkomang'ombe ward

Name of village	Mat maker	Stone mason	Metal worker	Carpenter	Potter
Nyambalapi	27	8		3	
Kimelembe				4	1
Nkomang'ombe	25	3		1	8
Mhambalasi	15	2		4	
Igunga	48	2	1		
Idusi		29			
Mjimwema			6		

Source: Masasi Division Baseline Report, 1994

Income and expenditure

Both males and females contribute to the household income by a variety of ways. Activities undertaken by the family is dependent on the skills, tools, materials available. Lack of a formal market structure has prevented the growth of commercial activities in the area. Most selling is small scale and informal. Villagers sell their wares along roadside or outside their homes.

Sale of food stuffs (foodgrains, fruits, vegetables, meat and eggs) is an important source of income. Foodgrains are sold after the harvest when there is a surplus, usually within the village or in a neighboring village. Bartering of food stuffs is common practice. People of Nkomang'ombe village exchange maize for rice and cassava. 44/70 households indicated that they earned some income from agriculture. Majority of the households indicated that they sold meat and eggs (Table 9). Fishermen questioned said they sold their catches at Ludewa, Mbinga and Songla. However price of fish varied with type, size and season.

Table 9. Household income generating activity (for 38 households to be displaced)

Goods sold	Crops	Fruits & vegetables	Meat	Eggs	Dairy production	Beer & basket	Income transfer	Others
No. of household	21	10	24	31	2	23	2	2

Source: Data Collected, 1996.

Other sources of income identified through direct questioning of the people in the area are as follows: salaries 3/32 persons, (two were teachers and one was a medical attendant). 5/32 households owned small businesses/shops, bricklaying (3/32) and masonry (1/32). Sale of beer, firewood, grass, mats and baskets is also common. Some men in the village work as casual labourers but the cost of labour varies from place to place.

Only two households mentioned benefiting from transfer of income. Earnings from various sources varied from Tsh 10,000 to Tsh 67,000 yearly for some of the families.

For majority of households the main expenditure constitutes school fees, purchase of food items, clothes and taxes levied on various items (Table 10). The expenditure figures are also highly varied and basically it is difficult to actually ascertain exactly what the people earn and how much they spend on various items as there is a general reluctance to disclose such information. Besides, the people are unsure about their earnings and expenses.

Table 10. Taxes levied

Item	Dev. levy	Livestock tax	Meat inspection	Cash crops	Bicycle tax	Pombe Bars tax
Tsh	M = 1500 F = 500	Cows = 150 Pigs = 150 Goat = 100	Cow = 300 Pig = 150 Goat = 50	Tobacco = 2 per kg	500	400

Source: Masasi Division Baseline Report, 1994

Infrastructural services

Roads

The entire area is insufficiently connected and the existing roads are in desperate need of repair. In Ludewa district, there is a single earth road which serves as the main link between Njombe and Manda. A 25 km feeder road exists between Nkomang'ombe and Iwela but is not motorable in most of the seasons. Most vehicles entering the division do not venture further south of Kimelembe and Nkomang'ombe as roads are essentially impassable. The situation further worsens during the rainy season. Lack of a proper road network has prevented the growth of the division.

Schools

The Tanzanian government initiated a programme for primary education in 1975. The project aimed to provide every village with a school. In the Nkomang'ombe ward, there are 2 primary schools, one located in Nkomang'ombe and another in Kimelembe. The school curriculum concentrates on natural resources theory and practice, aimed to

improving the agricultural skills of the population. Schools face shortage of adequately trained teachers and equipment i.e. desks and chairs. All the primary schools in the division are in poor structural condition and require repairs. Adult education programmes are also undertaken between the months of May and October in each village. However, attendance is low due to general ignorance about the existence of the programme.

Banks and post office

The nearest bank is in Ludewa town, which is about 29 km and the only post office of the division is in Manda approximately 36 km away. Given the fact that communications between the project area and other parts of the district is difficult, the community does not benefit from these services.

Health status in the area

Health facilities

Nkomang'ombe and Iwela villages are served by a government dispensary that distributes health services free of charge to the local population. The Nkomang'ombe dispensary is reasonably well equipped and staffed with five health workers, which includes a mother and child health advisor. Often the services provided by the health facility extends beyond the village, although drug availability does determine effectiveness of the service. Drugs are supplied once a month through an EPI/UNICEF scheme. Traditional medicine is also practiced in the area. In both Nkomang'ombe and Iwela, there are 4 traditional birth attendants and 3 traditional doctors.

Health profile

Diseases in the area have been directly associated with the seasons. Diseases like malaria, bilharzia and diarrhoeal disorders are known to occur primarily on the onset of the rainy season. Among the 38 respondents asked about commonly experienced ailments, all respondents confirmed that at least one individual in the household had suffered from malaria and dysentery. Children were most vulnerable to dysentery. Pools of stagnant water are seen by the local population as being responsible for the outbreak of the diseases. Official health statistics support this relation especially for malaria and bilharzia. However a significant number of cases go unreported in the region. In 1994, 210 cases of malaria and one case of bilharzia were reported from Nkomang'ombe village. Other diseases which the population was exposed to were TB (22/38) and scabies (17/38).

Due to successive food shortages experienced by the area, there has been a decline in the nutritional intake of the people, especially the children. CONCERN Worldwide

conducted a survey of the nutritional status of population. 14.5% of the children (< 5 years age) in the Nkomang'ombe ward were found to be under-nourished. Additionally, between the months of January and March, the area experiences an overall scarcity of food which is also responsible for the low nutrition levels in the population

Sanitation

The Tanzanian government undertook to broadcast a programme "Man is Health" which aimed to educate the villagers about the health impacts of improper sanitation. The programme received a tremendous response and latrines were constructed in all rural areas. In Ludewa district out of about 19,700 households, 19,310 had pit latrine and only about 160 households had flush toilet facilities. In Nkomang'ombe ward, out of 428 households, 408 had pit latrines, 5 flush toilets, and the balance did not have any latrine and used the neighbors facilities or the bush.

Water availability

In Ludewa district 48% of the population has water supplied within 400 m of their residence. In the district 50% of the villages did not have any water supply facility. The Nkomang'ombe and Iwela wards in the study area also did not have any water supply facility. The people of the area depend on dugwells and river for water. The households questioned in Idusi village reported that half of them collected water from the Mchuchuma river and the other households utilised wells. All water points were within a kilometer from the house. In Nkomang'ombe village 24/33 households got their water from shallow wells. Only 9 households said they collected from the river. Iwela too, has 8/15 households using the river for water. However, all houses use hand dug wells in the dry season. In Kimelembe village, all households utilised the well pumps installed by the Danish International Development Agency, Danida.

Distance of a water point from the household varies from less than 1 km to 1.5 km. However, 3 households claimed that the nearest water point was 4 kms from their homestead. Water sources are not protected and only 7 households claimed boiling the water prior to consumption. Livestock watering and washing of clothes are often undertaken at the same water point.

The task of collecting water is the responsibility of women and children. Frequency of water collection depends on the distance of the water point. On an average water is collected twice a day, once in the morning and again in the evening. Waste water generated is often applied to fruit trees and vegetables which are situated near the homestead.

Fuel and power

In Ludewa district only 2% of the households were supplied with electricity. Fuel wood and biomass residual accounts for the total energy consumption in the district. Villagers use the woodland for firewood, timber, poles, fodder for livestock, canoes, medicines, fruits, hunting and bee-keeping. Firewood, an important forest product is available in plentiful in the village. Although villagers are of the opinion that forest cover was more abundant in the past, very little tree planting is undertaken except for fruit trees. There are very few introduced species. Lack of any formal forest management is causing destruction of the woodlands. The most serious problem in the area is that of woodland clearing for finger millet cultivation. Collection of firewood is also an activity that falls in the domain of the women and children. Local people have good knowledge of trees and their use is extensive. Roots, barks, leaves of the local trees are utilised as traditional medicine.

Cultural profile

The people of the division predominantly belong to the Wamanda tribe who originate from the area but in the past lived on the shores of the lake. They were forced to move inland when floods occurred in the area. Kimanda is the language spoken by the people but majority also speak Kiswahili. Religion is an important aspect of the life in the rural population and it has been used as a tool for disseminating socially conscious information. Most people belong either to the Anglican or the Roman Catholic church. In the village there are two Roman Catholic churches and a Anglican church.

Marriages and deaths are occasions when the family requires a considerable amount of money to perform the necessary ceremonies. Marriage is a great occasion for celebration for the entire community. Prior to the wedding, there is a custom of "bride price" that the groom has to give to bride's family. This is often in the form of cattle, clothes and money. Once the bride price is paid the marriage can take place. Death, is a sorrowful event for the entire village. The community comes together to mourn with the bereaved family. Last rites are conducted as per the christian faith and the body is buried at the cemetery.

Social life of the population revolves around *pombe* (home made beer) and *ulanzi* (bamboo juice). People gather at small bars or village clubs as well as visit each others homes usually in the evenings. After the harvest, there is always much drinking and dancing, celebrating the good harvest.

Community structures

The village council is the prime governing body for each village. Village council acts as an extension of the government working towards the development of individual villages.

Its main functions are to

- provide development for the village
- interact with the villagers and government
- allocate land to villagers
- provide local security

Village council is headed by a chairman who is elected by the villagers. Working under the chairman is the Village Executive Officer, who is appointed by the District Council and interacts between the village and the district councils. The village council also consists of several sub-committees which are responsible for security, finance, welfare, education and agricultural needs of the village. Funds for the working of the council are derived from the development levy that each village adult must pay. The village council holds office for 5 years, after which elections are held for the post of chairman and sub-committee members.

Dwelling place

Nkomang'ombe is a rural ward comprising of 9 villages. Of the villages,

Nkomang'ombe village is the largest consisting of a third of the houses in the entire ward (Table 11). A typical homestead consists of a living quarters surrounded by a field. Fruits trees and vegetables are found planted close to the house. Most houses are constructed of mud with grass roofing (19/32). More permanent dwelling are constructed using burnt bricks and grass roofing (9/32). Only 3 of the households interviewed used burnt bricks and C I sheets and all of these were located in Nkomang'ombe village.

Communal lands

Certain areas within a village are set aside by the village for the use and benefit of the entire community. This practice is no longer extensively prevalent, and villagers prefer to grow and manage their agricultural and other natural resources on an individual basis. In the Nkomang'ombe village communal land is rented out to villagers.

Household composition

The average family occupying a household consists of over 4 persons living and sharing the owned resources. It is customary for men to have more than one wife (13/32). The wives however may not stay in the same compound. Elderly and disabled members of the family are cared for in the home.

Table 11. Population and number of households

Name of village	Population	Number of households
Mhumbi	219	46
Mhambalasi	169	35
Nkomang'ombe	453	113
Idusi	218	44
Igunga	190	38
Mjimwema	165	37
Kimelembe	232	46
Nyambalapi	149	31
Ntiule	217	38
Total	2012	428

Source: Masasi Division Baseline Report, 1994

Status of women

The African women is known to be the backbone of the rural economy. They spend over 10 hours a day working in the fields, collecting woodfuel and water. The prevailing traditions of the area can be seen to be against women. There is polygamy, where the husband can marry more than once. Customary inheritance rights also follow the male lineage. On the death of the husband, land often reverts back to male members of the family, the wife often has to buy back the land if she wants to continue living in the same place. All these customs lead to the marginalisation of the female population. It has been well documented that the female headed households are often the poorest in a community. Additionally, the power of the women is further eroded with the growing commercialisation of agriculture which is often dominated by men.

Identification and assessment of social impacts

The opening of the first coal mine and coal based thermal power plant in the area would have significant impact on the economy of the Iringa region, about 98% of the population in Iringa region presently have no access to electricity.

Impacts of the proposed mining and power generation activities, on the population in the study area are both direct as well as indirect. The direct impacts are those on the population that has to be displaced, the land and the water resources of the area. In addition, the direct impacts could also include employment generation, improvement of communication (roads, etc.) and availability of coal and electricity in the area. Indirect impacts would be migration of population from outside the area, land-use changes, occupational changes, income pattern changes, health impacts, etc.

Direct impacts

Displacement of population

Approximately 50-60 households from the villages of Nkomang'ombe, Idusi and Iwela, situated within the study area will have to be relocated. Relocation of people is often the most significant negative impact of any development project. Presently, subsistence agriculture is the basis of sustenance for the community. Households earn income through sale of food grains (21/38) and fruits and vegetables (11/38). Relocation would imply a loss of at least a year's yield of food grains as fields need to be cleared prior to sowing. Besides, a considerably longer time lapse before a vegetable garden and fruit trees can provide an income for the family. This could force households to consume their grain reserves or purchase food with the limited cash that is available to them.

Decline in the availability of food for a displaced households due to loss of crop yield, fruits, vegetables, etc. and lack of economic means to purchase it could cause serious malnourishment problems for the family. Children of these households will be most vulnerable to malnourishment particularly because the region already has a high prevalence of undernourishment among the younger age group. Moreover, in Tanzania 53% of all infant mortality under the age of five are associated with malnourishment.

Relocation of households could also cause isolation of households from their sources livelihood and income. Households might be distanced from existing water sources placing a burden on the women who would have to spend greater time on water collection. Increased distance from income source could negatively affect the earnings of the fishermen and shop owners - increase in distance from river/lake and shop respectively.

Population increase in the area

The population of the study area would increase in the future due to (a) normal growth (at about 2.5% per annum) and (b) migration of skilled work force from other areas for employment in the proposed mine and power station. It is estimated that the proposed project would employ about 1,000 persons directly. The large scale migration, which would consist mainly of young men, would alter the existing gender composition in the area. Presently, there are more females in the area (in the age group 15-46) and this may reverse in the future. The increase in population would affect the land use pattern, and limited services which are available in the area.

Availability of water

As the area lacks formal water supply network and dependence on rivers and hand dug wells is significant, consensus existed among the respondents for the need for improved water supply. The proposed project would also require significant quantities of water to meet its needs. The increase in water demand brought on by the project coupled with increased demand for potable water by the growing population would place a severe strain on the present water resources.

Although there is some quantity of unutilised groundwater available in the area, the hydrological report clearly states that the reserves are inadequate to meet the needs of the project.

Impact on employment opportunities

The proposed projects would provide direct employment to about 1,000 persons. A large proportion of these people may be migrants from other areas. But the local population will benefit directly from employment opportunities as unskilled labourers, especially during construction period. The local population can be suitably trained for semi-skilled jobs also.

Influx of people into the area will create an expanded market for those owning retail outlets. Several households are already involved in an informal market system basically selling food stuffs. Growth in demand will encourage community members to establish more shops and small businesses to meet the needs of the rising population. General trends should indicate an improvement in the economic status of the local community.

Impact on poor families

Barter system is still prevalent in the area and it is the poorest households who are able to find sustenance in this way of life. But, accompanying development there is always commercialisation of society. All services in the area will gradually be monetised and so

the poor with little funds, few skills and already at the bottom of the income strata would be pushed further into poverty. In many instances these people are coerced into moving out of the area to another area where subsistence living is still possible.

Impact on forest products

The area is well endowed with woodlands. All households utilise the forests for timber, firewood and food. Dependence on the forest products has not yet affected the availability of the resource but as the area develops and more people move into the area, exploitation of the forest might outstrip natural regeneration. At this point, availability of resource might become a problem. This situation is most likely to occur during the construction phase of the project when a significant number of people will be dependent on the forest for fuel. However, during the operational phase of the project some of this pressure is likely to reduce if the workers in the project are provided with coal.

Indirect impacts

Impact on health status

Water borne diseases are the most common ailments in the region. The community is already experiencing high incidence of diarrhoeal disorders caused primarily due to consumption of contaminated water. Insufficient sanitation facilities, lack of piped water supply and growing population will only exacerbate the situation. Children are most vulnerable to the disease.

Furthermore, the proposed project plans the construction of an ash pond in the area. Ash ponds contain traces of heavy metals i.e. lead, which can percolate and pollute the local groundwater reserves. Consumption of water contaminated with these metals can cause serious health abnormalities for the community.

Malaria is another serious health problem for the local community as every household to be displaced has experienced the disease. Presence of the Mchuchuma project could aggravate the problem if water used in the mines is improperly disposed creating stagnant pools of water which could support vector breeding mosquitoes and bilharzia snails.

TB and scabies are also frequently occurring diseases in the area. With the project more people are likely to work in close proximity to each other. As both TB and scabies are highly contagious, there is a great possibility that the number of people exposed to the disease will increase.

AIDS is a major cause of health concern throughout Africa. AIDS incidence is 1% in the Iringa region. World Bank in its publication "*Better Health In Africa*" states that

there is a possibility of transfer of AIDS to rural areas of Tanzania bordering Malawi. Development in the area might lure Malawians to look for employment across the border. With the transboundary movement, diseases like AIDS which are highly prevalent in Malawi could become a problem for the local population presently unexposed to the disease.

Thermal power plants release certain pollutants into the surrounding environments. Continuous inhalation of significant quantities of these pollutants could cause respiratory complications among the people. Thus, in the case of the Mchuchuma Thermal Power Plant in its operational phase it could cause air pollution which might affect the health of the local community.

The survey revealed that the community was dissatisfied with the present health facilities, sighting them as inadequate. All households declared that the village needed maternity facilities. Migration of the people into the area combined with a possible rise in incidence of diseases is going to place additional pressure on the existing health facilities. The entire area is serviced by a sole health centre at Manda approximately 36 kms from the project area.

Impact on grazing land

Livestock are an integral part of the local community's lifestyle. At present, ample grazing is available, and all animals of the village graze close to the homesteads. Interviewees stated that livestock is also brought here from other areas for grazing. Growing demand for land for settlement purposes coupled with increase in livestock numbers as a result of growing households, places notable pressure on common grazing lands of the village. Mchuchuma project and its associated development can contribute to heightening this trend. The project affected people should be relocated in appropriate place with adequate land for cultivation and grazing.

Educational facilities

The existing 2 primary schools in the area and 1 secondary school about 12 km away will not be able to cope with the increased population. Respondents of the survey were also of the opinion that the area requires increased numbers of both primary and secondary schools.

Communication network

The area at the moment is not well connected to other parts of the region. The project will encourage the development of better roads, telecommunications and postal system. Improved communications will improve the mobility of people and goods encouraging further growth of the area.

Energy supply

There is no electric supply in the area. Local people depend upon firewood to meet their energy demand. The proposed project would be able to supply coal and electricity to the affected population and others in the area. Availability of electricity would be very useful in hospital/dispensary to store essential medicines under controlled conditions.

Banking services

At present, the nearest bank is in Ludewa town, but with the opening of the proposed project, it is essential that banking services are provided in the area. The presence of a bank will encourage the community to save their earnings. Also the bank would be able to provide credit to the local population for undertaking home-based business like poultry farming, etc. This 3.2 Cultural changes

Impact on subsistence economy

The entire community is largely isolated from modern developments. It's survival is dependent on the prevailing subsistent economic activity and barter system. The project will on the other hand bring along with it salaried staff, people whose survival depends on their ability to purchase commodities from the market. Presence of a monetary economy will gradually overshadow the present subsistence economy. Community will become involved with market driven activities i.e. commercial agriculture plus a labour market will be created. All services will be bought and sold in currency units.

Impact on the existing practice of polygamy

In the area it is common for men to practice polygamy. With the advent of the Mchuchuma project there is likely to be an influx of young men into the area, reversing the existing gender ratio. This might also bring about a change in the marriage patterns.

Impact on "bride price"

Disproportionate number of marriageable women present in the area compared to eligible men might encourage the parents of daughters to increase the bride price which the groom must pay to marry the girl. Even now, bride price places a significant strain on the groom. Marriages are long delayed with couples having several children together without legalising the union. This trend could worsen due to increase in bride price which could result in greater promiscuity and thus increased exposure to lethal diseases i.e. AIDS would contribute to the development of the region.

Mitigation measures

A major impact of the proposed project is the displacement of about 60 households from the core area. Displacement of people from their habitat invariably results in psychological stress brought on by apprehension and unfamiliarity of the new surroundings. Considering the disturbance they are faced with as a result of involuntary displacement and their aspirations, it is essential that their needs are met as far as possible by the project. It is reported that relocation of the PAP will be done by the village council and district council officials. The displaced population will be given equal amount of land for resettlement. So as to ensure that the existing social network is not disturbed, resettlement should try to maintain the same spatial distribution of households. To an extent, this is a way of reducing the stress of relocation.

The following rehabilitation package for the project affected population is suggested:

Rehabilitation package for the project affected population

- Since subsistence farming is the means of subsistence for all displaced households, their relocation should be to a land that is of the same size and fertility as the previously owned land. Land should be allotted by the village council.
- Relocation should be initiated after the harvest to prevent loss of crop yield.
- If loss in the yield of crop is unavoidable, families should be provided with food required to meet their needs. And this support should extend till the household retains self sufficiency in food production.
- Each of the displaced households be assisted with transportation of their belongings and establishment of the house, fence, pit latrine, etc. at the new dwelling site.
- Households that operate retail outlets and are forced to relocate these establishments should also be assisted in relocation of these businesses to the resettlement area.
- 21 households who sell their crops seasonally should be compensated for the loss of income due to displacement. These could be calculated as per existing laws or on the basis of the average yield during the last 3-5 years and the market price of the crops.
- For households who carry out vegetable gardening and fruit production for self consumption (all 38) and income generation (11/38), assistance could be through distribution of seeds, saplings and any other inputs that are required to renew the activities. In case of fruit trees which need time to yield benefits, monetary compensation on the basis of yield, market value, etc. should be given.
- Employment opportunities: Employment provision for one member of the displaced household is not compulsory under the laws of the government. But in the interest of

social benefit to the population in the area, opportunity for direct and indirect employment should be provided. Depending on interest shown by the displaced population, adequate training and skills should be provided to at least one member of each displaced family to work on the project or in self-employed activities. The poorest households in the area should be given preference in training and employment opportunities. Skills could be imparted to carryout commercial agriculture, horticulture activities and poultry farming, etc. This would result in improving the living standards of the population. In addition, availability of adequately trained workers in the vicinity of the project, will reduce the expense of transferring workers from other areas.

Water availability

It is reported that the project authorities have planned a pipeline from Katewaka river to draw water for meeting the needs of the project and the local population. The existing water resources of Mchuchuma, Idusi and Nyakpenda rivers will not be affected by the proposed project. It is suggested that piped water for the local community (including the workforce) at selected water points near households should be provided. Water quality at the Katewaka river should be checked and if necessary should be treated before supply to households.

To reduce the pressure on local water resources, the project proponents should adopt water conservation techniques and encourage the community to follow their example. Since the region receives high rainfall, a simple and inexpensive harvesting method could be demonstrated by the project proponents by applying in the resettled houses. This could then be replicated in individual houses, schools and clinics. One such method is as follows:

- Use of corrugated tin roofing material with an attached drain at the ends. This will not only help collect rain water but also prove more durable and save grass and thatch used commonly for roofing.
- Leading from the roof drain there can be an outlet for the water to collect into a drum on the ground. Collected water can then be used for domestic purposes.

Health facilities

As the area experiences a shortage of medical facilities, adequate number of hospital/dispensary/maternity home should be provided in the area to cater to the needs of the population. In addition, preventive measures should be taken to control the incidence of various diseases. These are as follows:

For water borne diseases

- Project proponents should provide piped water to the resettled households staff of the project and the local population in the study area.
- Any new wells constructed by the project proponents must have provision for covering. Local authorities should take steps to cover existing wells;
- Local authorities should encourage households to conduct activities of washing, watering livestock at a distance from the actual water source to reduce possibilities of pollution;
- Areas surrounding the water point should be kept clean, and waterlogging must be prevented as this often provides a breeding ground for diseases;
- Health authorities should urge households to boil water prior to consumption especially during the rainy season.
- Chlorine capsules could be made available free or for a nominal price at the local clinic, school, church thus easily accessible.

For malaria

- Mosquitoes breed in stagnant water and garbage. Project proponents should ensure that their work site does not become a breeding ground for mosquitoes
- Community should arrange regular clean ups of the village especially in the rainy season
- Mosquito nets should be made easily available
- Village council could arrange that the area be sprayed at least once during the rainy season
- Lavigerous fish that feed on mosquito larva could be introduced into seasonal ponds. Other biological control against should also be used, as these methods have semi-permanent effect as opposed to transient relief afforded by insecticides.

For bilharzia

- Project proponents must ensure that waste water does not collect as it could bring about the propagation of bilharzia snails
- Prior to drawing water from the Katewaka river, the project proponents must test the water to ensure that diseases like bilharzia will not be transferred into the region through the pipeline.
- Molluscicide should be applied to the vegetation around the banks of rivers as this is the ideal habitat for snails. It would kill all the snails present
- As livestock are the intermediary hosts of the disease, water troughs should be constructed along the rivers for the livestock, preventing them from entering the water.

For tuberculosis (TB)

- All staff employed by the Mchuchuma project must undergo a thorough medical check up at the time of joining and periodically after joining for communicable diseases like TB and scabies
- Local clinics should be equipped to undertake immunisation. Children can be immunised against TB. Immunisation should be done soon after birth.

For scabies

- Greater personal hygiene must be encouraged by the local medical authorities.

Local health authorities should conduct an awareness campaign to promote greater knowledge of the local diseases, how they are spread, what are the symptoms, what are the preventive measures. This would go a long way in early detection and cure of the diseases.

For respiratory diseases

Respiratory ailments that may occur due to the presence of air pollution caused by the Mchuchuma TPS can be easily prevented if international air quality standards are maintained by using appropriate pollution abatement technology.

Education facilities

Based on the expected impact on the existing educational facilities, due to increase in population, the following measures are suggested:

- Construction of at least one more primary school in the area by the project proponents
- The area also needs another secondary school situated closer to the village
- As the area is likely to experience development and increased flow of money, the relevant Ministry must review the school curriculum which at present places emphasis on natural resource management. Subjects like mathematics, pure science along with vocational training in carpentry, mechanics, pottery etc. should become part of the school curriculum to ensure that the next generation is equipped with skills that would prove useful in the changed environment.

Fuel supply

- Construction of the project is likely to require clearing of parts of the woodland. The woody biomass could be either distributed free or for a nominal cost to the workers at the project.

- Once the coal mine is operational, coal could be provided free or for a small fee to the local community as fuel for domestic purposes. This would reduce the pressure on the natural forest. Use of coal as a fuel could also reduce the burden of women to gather firewood from forest.

Afforestation

- Mchuchuma project is likely to require a large forested area be cleared for the development. To compensate for this removal of woodland, project should undertake afforestation in another area:
- Indigenous species should be planted:
- For afforestation, participation of local community and children would prove beneficial for the entire village as the area at present does not practice tree planting, this would inculcate the interest for tree planting:
- Green belt development could be undertaken around the mining area by the project authorities. Community could be involved in plantation and managing of the trees. Once the trees have grown, the community could be allowed to utilise the products on a sustainable basis.

Adequate grazing

- Presence of a green belt close to the mine could also be useful for providing regular supply of fodder for the local livestock;
- Local authorities may have to ascertain the carrying capacity of the grazing lands and then enforce a rule that each family is allowed to maintain only a maximum number of animals (specified by the authorities) in the area. This will prevent overstocking;
- Rangeland management practices should be encouraged in the area.

Banking facilities

Because the local community is poor and largely unexposed to a cash economy, resettlement will result in many of these families receiving large amounts of cash as compensation. Inexperience in dealing with so much money, might cause mismanagement of funds and the family may lose out. Often cash is controlled by the male member of the household and sudden financial gains could encourage social evils - the men may resort to drinking.

Banking facilities should be opened in the area and monetary compensation may be deposited with the bank in individual households account. Awareness campaign should be carried out to sensitise the population on the advantage of banking and savings.

Economic status of the local population

The Mchuchuma project will have a combination of both positive and negative impacts on the local population's financial conditions. Some households may experience a considerable improvement in their living standards than others. Urbanisation of the area would create social disparity among the population. However, through the questionnaire it was evident that all households expected the project to provide them opportunities for employment and business for improving their living standards.

Changes to a woman's life

Rural women are the main providers of sustenance for the family. They grow, collect and prepare food, collect water and firewood. As the woman's life is closely associated to the availability of natural resources, their availability is an important issue. The proposed Mchuchuma project is likely to change the local environment thus altering the life of the local women. The development of the proposed project would lead to availability of water, fuel, and facilities for education, health, communication, etc. in the area. Therefore, it is essential that the status of the women should be improved in the changed environment in the area. Status of women has greater influence on infant and child mortality, health, nutrition, education and thus on fertility and population. And a woman's status and decision making powers in a family and community are dependent on their health, education and income earning abilities. Suggestions for improving the status of women:

- Project proponents must encourage participation of women in their labour force, especially for female headed households. Relevant training must be provided to ensure no discrimination occurs between the men and women:
- To prevent isolation of the women from the cash economy, local authorities must encourage development of various skills among women i.e.
 - Bee keeping
 - Jam and jelly making as there are several fruit trees in the area
 - Vegetable gardening
 - Start plant nursery
 - Pottery
 - Sewing, knitting, weaving
- Some women could also be trained as medical assistants and mid wives.
- Credit facilities should be made available for women who want to start commercial ventures such as cash crop production, horticulture all which require large inputs.
- Awareness campaigns on the importance of literacy must be conducted to encourage families to send their daughters to school, both primary and secondary.

- Improvement in economic condition of the women through various employment opportunities will enable the women to purchase food in times of shortages reducing possibility of undernourishment:
- Provision of coal as substitute for fuelwood would reduce the burden of wood collection on the women:
- To improve efficiency in fuel use, improved varieties of cookstoves should be introduced into the area. Local women must be trained in construction of these stoves.

Recommendations

- Project proponents must implement all the mitigation measures suggested in this study and forward the suggestions made for the local authorities to the relevant person/s, to ensure that all possible impacts are addressed.
- Compensation due to the displaced households must be provided promptly to prevent unnecessary hardships for the families.
- As detailed information is available for only 38 of the 60 households to be displaced, a comprehensive study must be conducted for the remaining households not covered by this study.
- Project proponents **must** monitor the entire process of resettlement and rehabilitation to ensure that all components are adequately covered.